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The Effects of Assignment Format and Choice on Task Completion

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Abstract

Modifying task presentation format and providing opportunities to choose are two effective procedures teachers can use to improve academic productivity for students with learning difficulties. Combining the two procedures may result in academic interventions that teachers can use without significantly changing the curriculum. The present study investigated the effects of choosing between total task and partial task presentation on academic productivity of three 4th grade students with learning disabilities. In the context of an alternating treatment design, the results showed that task presentation format may influence student preference and may be a promising choice alternative teachers can provide. The results also suggest that the effectiveness of choice making depends on the relative discrepant preference levels of the choice alternatives.

Keywords: choice, task format, academic task completion

1. Introduction

Researchers continue to investigate methods that most efficiently and effectively promote academic competence. One promising area that appears to be a key component of academic achievement is opportunities to respond via independent academic assignments (Trautwein & Koeller, 2003; Trautwein, Koeller, Schmitz, & Baumert, 2002). Haring and Eaton (1978) argue that drill and independent practice are critical and necessary instructional component used in all stages of learning. For example, during skill acquisition independent seatwork in combination with demonstration and modeling allows the learner to acquire new skills successfully and efficiently (Skinner, Pappas, & Davis, 2005). After skills have been acquired, the learner can achieve fluency through active and repeated responding to targeted academic assignments (Skinner, 1998). Academic assignments that incorporate drill and repeated practice also facilitate generalization and adaptation. For example, activities designed to practice previously learned skills in the solution of new problems make the skills functional in daily life (Blake, 1974). Clearly, maximizing the benefits and efficiency of independent academic assignments is critical for both teachers and their students.

The effectiveness of independent academic assignments is directly related to the rate of active responding on those assignments, as frequent opportunities to respond increases academic achievement (Greenwood, Delquadri, & Hall, 1984). Greenwood and colleagues found that teachers can improve student learning by eliciting frequent responses from the students. This finding implies that students should be placed in learning situations that promote (a) active responding and (b) high rates of correct responding. During independent work, students should respond at a rate of 9 to 12 responses per minute with a minimum accuracy of 90% (Stephens, 1976). Unfortunately, students with learning difficulties tend to complete assignments more slowly, far below the recommended rate, and with a lower accuracy. Correct responses for these learners can range from 20-76% (Carpenter-Aeby & Aeby, 2001; Umbreit, Lane, & Dejud, 2004). This discrepancy highlights the need for independent assignments that promote high rates of correct student responding.

One procedure that teachers can use to increase academic productivity and engagement is providing students with choice-making opportunities. As one example, Cosden, Gannon, and Haring (1995) investigated the effects of choosing academic tasks and reinforcers on the productivity of students with severe behavior problems. In the choice condition, the teacher provided the students with a choice of ten tasks from four academic areas including reading, writing, mathematics, and science. In addition, the students could choose one of ten reinforcers (e.g., games, magazines and activities) contingent upon task completion. During the no-choice condition, the teacher

assigned the academic tasks and reinforcers without giving students the opportunity to choose. Cosden et al. found that students completed the task at a higher rate and accuracy when they had control of either the task or reinforcers. In addition, when students chose both task and reinforcers they completed the tasks with the highest level of productivity. Other researchers reached similar conclusions when they provided students with a choice of task sequence and materials (e.g., Jolivette, Wehby, Canale, & Massey, 2001; Moes & Frea, 2000).

Although effective, the implementation of a choice-making procedure in classroom settings is limited by the choice options that teachers can provide (Romaniuk et al., 2002). It is feasible to provide choice options that include tasks from different academic areas (e.g., math, reading) or different types of tasks (e.g., flash cards, computer-based practice) from the same content area in a self-contained classroom (e.g., Cosden et al., 1995; Jolivette et al., 2001) or in one-on-one homework assignment tutoring sessions (Moes, 1998). However, it may be more difficult for teachers to offer such choice options in regular education classes, because teachers generally expect all students to work on the same academic assignment with the same rules and behavior management techniques (Meadows, Neel, Scott, & Parker, 1994). Thus, choice as an intervention may be less acceptable when options vary widely or when choice options differ significantly from the typical curriculum or classroom activity (Kern, Choutka, & Sokol, 2002).

One choice alternative that teachers can provide without significantly changing the academic task is task presentation format (e.g., Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Dunlap et al., 1993; Kern, Childs, Dunlap, Clarke, & Falk, 1994). Teachers can create identical academic tasks using different formats or materials (e.g., stapled worksheets, paper slips, index cards) and provide students with an opportunity to choose to complete the assignments using their most preferred format. For example, Dunlap et al. (1993) modified task materials by separating individual worksheets from a stapled packet and giving students the worksheets one at a time. Likewise, Wallace, Cox, and Skinner (2003) cut math worksheets containing 30 subtraction problems into five or six separate paper slips; each containing five or six problems. In both studies, students had a higher rate of completion and engaged in more appropriate behaviors when they worked on the modified task format. It was hypothesized that student behavior changes were attributable to both changes in discriminative stimuli and decreased aversiveness of the original tasks (Conroy & Stichter, 2003). Task modifications may also change the dimensions of reinforcement associated with task completion (i.e., response effort, reinforcer quality and magnitude; Gunter & Denny, 1998). Therefore, modifying the task presentation format may alter student task preference without compromising academic integrity (e.g., making the assignment easier or shorter) and can enhance the feasibility of including choice as an instructional component in applied settings.

Given the results of research on choice-making opportunities and alternative task formats, interventions combining available choice options and task formats may elicit greater gains than when each procedure is used independently. Such research could enable the development of guidelines for effective and meaningful choice options that fit into current curriculum and instructional practices (Cullen, 1999). To that end, this study was designed to further address the effects of task format and choice by examining the effects of a format modification that can be easily made by classroom teachers. More specifically, we ask what are the effects of choosing between total task and partial task presentation on academic productivity?

2. Methods

2.1 Participants and Setting

In order to strengthen the external validity of the study, we conducted the study in a typical classroom setting. A special education teacher was asked to nominate students with a history of low performance in mathematics for possible participation in the study. Three 4th grade students were nominated and were subsequently recruited to participate. The teacher informed the students of the purpose of the study before the experiment. In order to protect participants' identity, we renamed the three participants as Ben, Mica, and Mandy in the study. Ben and Mica were both 10-year-old Caucasian male students. Mandy was a 10-year-old Caucasian female student. All of the participants were identified as having a specific learning disability using the criteria set forth by the Commonwealth of Pennsylvania. Unfortunately, further details regarding the participants' IQ test scores or their grades were not available. The teacher indicated that all three students exhibited frequent passive off-task behaviors during independent seatwork time (e.g., play with the pencil, staring at the ceiling, etc.).

All participants attended a resource room for reading and mathematics in a public school located in a large urban district in Southeastern Pennsylvania. Classroom staff included one part-time paraeducator and one special education teacher. There were typically 10-12 students present in the classroom at any given time. Instruction generally occurred in small groups. The special education teacher conducted the study in the back of the classroom (in an area approximately 5 m x 10 m) during the regularly scheduled math lesson.

2.2 Pre-Experimental Assessment

To increase the external validity of the study, the researchers asked the participants' classroom teacher to recommend math tasks in which each student needed more practice. The teacher indicated that Ben and Mica could complete two-digit by one-digit (2 x 1) multiplication tasks accurately, but required additional practice to improve fluency. Mandy needed to practice one-digit by one-digit (1 x 1) multiplication tasks to improve accuracy.

To further validate the selection of the academic tasks for this study, we administered a single-skill math assessment utilizing curriculum-based measurement (CBM) procedures before the experiment. Table 1 presents rate and accuracy data from this initial assessment across the three students. Assessment results indicated that Ben and Mica completed 2 x 1 multiplication problems at 23 and 17 digits correct per minute (DCPM) respectively. Both of the students completed the tasks with accuracy levels above 98%. Mandy completed 1 x 1 multiplication tasks at 11 DCPM with an accuracy of 63%. The initial assessment indicated that all three students' mathematics computation skills were below suggested fluency aims (i.e., 80-120 DCPM for single digit multiplication and 40-60 DCPM for multiple digit multiplication; Lin & Kubina, 2005).

Table 1. Total digits completed correctly per minute and accuracy on initial assessment across the three students

Student	Task	DCPM	Accuracy
Ben	2 x 1	23	98%
Mica	2 x 1	17	100%
Mandy	1 x 1	11	63%

2.3 Materials, Experimental Conditions, and Procedures

The researchers developed two assignments using two different presentation formats. For the first condition (WS), we developed worksheets (21.5 cm x 28 cm) containing 30 multiplication problems arranged in horizontal rows (i.e., 6 rows of 5 problems). For the second condition (PS), we presented the tasks on a 21.5 cm x 6.5 cm paper slip, each containing 3 problems. Problems for both the WS and PS formats were generated with Microsoft Excel® using a random number generator function omitting numerals 0 and 1 as single-digit factors in both 2 x 1 and 1 x 1 multiplications to better control for task difficulty level (Belfiore, Lee, Vargas, & Skinner, 1997). In each session, the teacher gave students individualized assignment packets. Each packet (both WS and PS) contained the same number of problems and contained more problems than the individual participants could finish in the 5min session. Specifically, Ben and Mica were given sixty 2 x 1 multiplication problems and Mandy had ninety 1 x 1 multiplication problems.

Prior to the start of the experiment, the teacher was trained by the researchers using a model (i.e., researcher demonstrates the procedure), prompt (i.e., researcher and teacher implement procedures together), check (i.e., teacher demonstrates ability to implement procedures independently) method of instruction and a procedural checklist. The teacher demonstrated 100% accuracy in treatment integrity prior to beginning the study.

The teacher scheduled experimental sessions during the last 15 min of regularly scheduled math lessons as independent seatwork. The students worked on the assignments under three experimental conditions (i.e., teacher-assigned worksheets, teacher-assigned paper slips, and student selection of worksheets or paper slips). Each condition lasted 5 min. During the teacher assigned WS and PS conditions, the teacher placed a packet of worksheets or paper slips directly in front of the student and said, "Here's the task you need to work on. Please work as fast and accurately as you can." During the choice condition, the teacher placed worksheets (WS) and paper slips (PS), each containing the same number of total problems in front of each student and asked, "Which of these tasks would you like to work on?" After the students selected the assignment packet in the choice condition, the teacher removed the other assignment and asked the students to complete the chosen assignment as quickly and as accurately as possible. The location of assignments during the choice condition (i.e., left/right), as well as the order of conditions were counterbalanced across days to control for location and order effects respectively.

Following the standard curriculum based measurement (CBM) procedures, the teacher timed students work using a stopwatch. After the students started writing the first digit on their paper, the teacher activated a stopwatch. The stopwatch was not visible to the students. At the end of 5-minutes, the teacher asked students to

stop working. This procedure was repeated until the students were exposed to all of the three experimental conditions. The teacher did not provide instructional or corrective feedback. At the end of the session, the teacher thanked the students for working, giving general verbal praise (e.g., "You did a good job today.").

2.4 Design and Dependent Variables

The teacher conducted the experiment on 10 school days for Ben and Mandy and 9 school days for Mica. (Differences in the number of sessions were due to absences and scheduling issues.) We used an alternating treatment design to examine the effects of each condition on student rate of responding on the academic assignments. Rapid alternation and counterbalanced order of experimental conditions allowed us to compare the effects of treatment conditions on the nonreversible academic behaviors in a relatively brief period of time (Tawney & Gast, 1984).

The dependent variables in the current study included digits correct per minute (DCPM) and student assignment selection during the choice condition. The special education teacher scored the assignments using standardized curriculum based measurement (CBM) scoring procedures for math (Hosp, Hosp, & Howell, 2006). Digits correct per minute was calculated by dividing the number of digits completed correctly for each assignment by 5 minutes. Research on CBM supports the use of digits correct per minute (DCPM) to measure students' skills and growth over time (e.g., Deno, 1985). In addition, we recorded total and percent of digits completed correctly. Total number of digits completed during a session was calculated by summing up the total number of digits that the student attempted and completed. Percent of digits completed correctly was calculated by dividing the number of digits completed correctly by total digits completed.

2.5 Interobserver Agreement

An independent observer scored 33% of the assignments from each participant. Point-by-point agreement was calculated by dividing agreement digits (either correct or incorrect) by agreement plus disagreement digits (either correct or incorrect) and multiplying by 100. Given the objective scoring procedure of student permanent product, interobserver agreement for student rate of task completion was 100%.

3. Results

Figure 1 shows the session-by-session digits correct per minute (DCPM) for each participant. Visual analysis of data from the alternating treatment comparison conditions show no obvious differences among the three conditions.

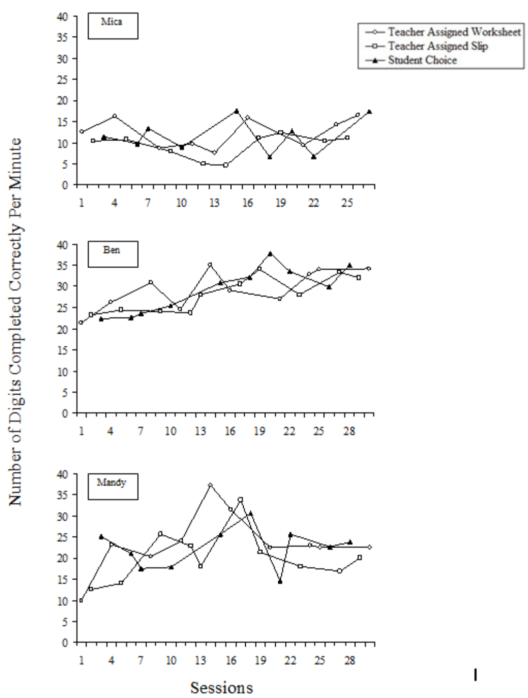

Figure 1. Digits completed correctly per minute across experimental conditions

Figure 2 shows the percentage of digits completed correctly by each participant across the three experimental conditions. There were no obvious differences of task accuracy across the three experimental conditions for the participants. Ben and Mica completed the tasks across the three experimental conditions with a minimum accuracy of 98% and 96% respectively. Mandy's task accuracy during the teacher assigned and student choice paper slips conditions were equivalent (M = 75%). Her task accuracy was lower (M = 69%) when the worksheets were assigned by the teacher. Mandy's total digits completed per minute (i.e., both correctly and incorrectly) was similar to her DCPM graph in Figure 1 and we did not find differences across the three experimental conditions (data not shown).

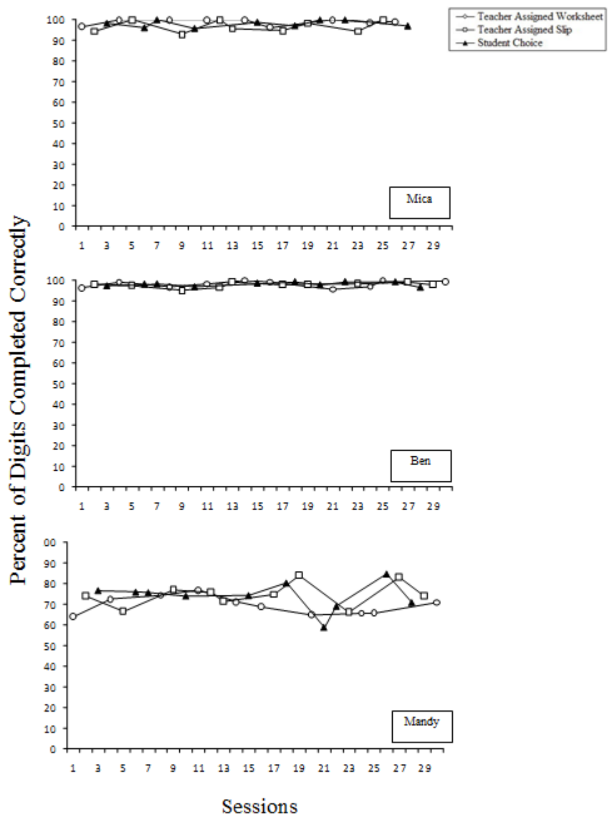

Figure 2. Percentage of digits completed correctly across experimental conditions

Figure 3 shows the cumulative percentage of worksheets and paper slips selected by the individual students. All three students demonstrated a preference for either the worksheets or paper slips. Mica and Ben selected the worksheets for 8 of 9 and 7 of 10 sessions respectively. Mandy preferred the paper slips, selecting that option for 7 of 10 sessions. Figure 4 shows the mean DCPM for each task format and the number of times each format was selected. Mica selected the worksheets eight times and paper slips once. When he selected the worksheets Mica had a slightly lower productivity (M = 11.88) than the teacher-assigned worksheet condition (M = 12.33). His selection of paper slips resulted in a slightly higher DCPM (M = 9.8) than the teacher-assigned paper slips condition (M = 9.29). The between-task format comparison (i.e., worksheets versus paper slips) suggested that his overall worksheets DCPM (M = 12.11) was higher than the paper slips condition (M = 9.56).

Ben selected worksheets seven times and paper slips three times. His choice of the worksheets resulted in a slightly higher level of productivity (M = 30.00) than the teacher-assigned worksheets condition (M = 28.83). His choice of the paper slips condition had a slightly lower DCPM (M = 27.73) than the teacher-assigned paper slips condition (M = 28.84). The between-task format comparison suggested that his overall worksheets DCPM (M = 29.42) was slightly higher than the paper slips condition (M = 28.29).

Mandy selected worksheets three times and paper slips seven times. Her choice of worksheet condition resulted in a lower DCPM (M = 21.80) than the teacher-assigned worksheet condition (M = 23.65). Her choice of paper slips had a higher DCPM (M = 22.71) than the same task that was assigned by the teacher (M = 20.30). The

between-format comparison suggested that her overall worksheets DCPM (M = 22.73) was higher than the paper slips condition (M = 21.57).

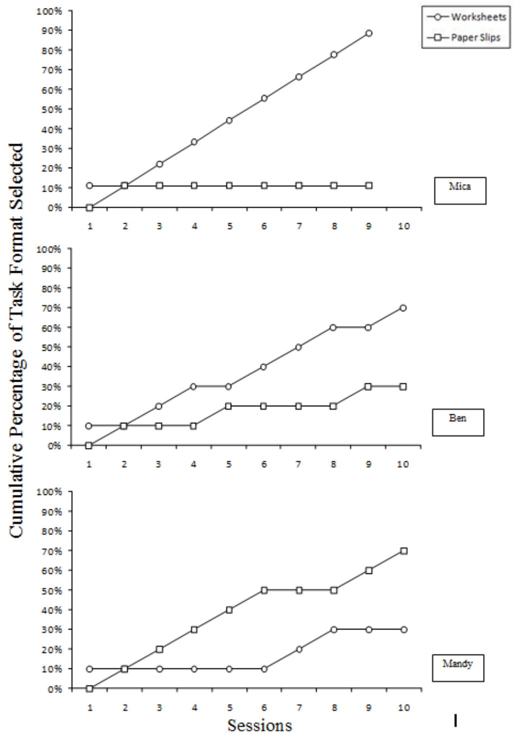

Figure 3. Cumulative percentage of task format selected by individual students

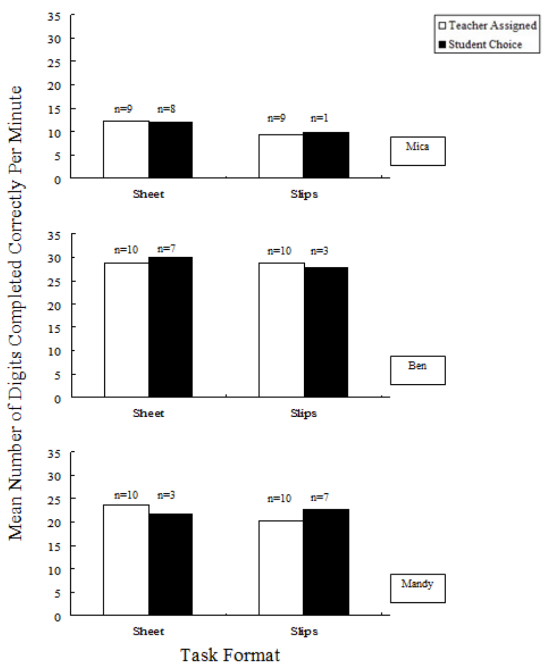

Figure 4. Number of digits completed correctly per minute by task format and selection procedure (represented by bars), and number of selections by teacher and subjects (number above bars)

4. Discussion

The purpose of this study was to examine the effects of choosing an assignment format on academic productivity. Overall results suggest that identical academic tasks using different presentation formats may affect student preference and choice of the tasks. Mica and Ben selected worksheets for 89% and 70% of sessions respectively, while Mandy chose the paper slips for 70% of sessions. Initial differences in responding to tasks, as well as task presentation format may change the dimensions of reinforcement (i.e., rate, quality, and effort) associated with task completion and affect preference.

Skinner (2002) suggested that students may prefer assignments that result in a higher rate of task completion, because rate of task completion is equivalent to the density of reinforcement associated with that task. In the current study, asking students to complete tasks presented on paper slips may delay task completion because of the extra time required to retrieve new problems. The worksheet condition did not require this extra step of reaching for new paper slips. Mica and Ben who had higher rates of task completion on the worksheets were more likely to choose tasks presented on the worksheets because the worksheets required fewer motor responses (i.e., no need to continually retrieve paper slips) and thus a richer schedule of reinforcement (i.e., more time spent completing problems).

On the other hand, Mandy, who started out the study completing problems at a low rate, chose tasks presented on the paper slips more frequently although this task format did not result in a higher rate of task completion. Perhaps the break (i.e., card retrieval) acted as a reinforcer (i.e., escape from demand) that affected her preference for the tasks. The present results are supported by Dunlap and colleagues (1993) who reported that individual students may prefer tasks presented on the separate worksheets because the act of getting a new worksheet makes task completion more reinforcing for these students.

Based on these results, the effects of task format on academic responding are individualized and based, at least in part, on initial fluency at completing the task. So, teachers can provide students with a choice of functionally similar activities with topographically dissimilar presentation formats (e.g., worksheet, flashcards, workbook) without compromising academic integrity, making choice options feasible in the applied education settings (Jolivette et al., 2001).

The results of the study also suggest that the effectiveness of choice-making depends on the relative discrepant preference levels of the choice alternatives. Among the three participants, Mica was the only student who showed a relatively higher level of preference for one of the tasks, selecting worksheets 89% of the sessions. His academic productivity on the worksheets was also 26% higher than the paper slips regardless of whether he selected or the teacher assigned the task. On the other hand, although Ben and Mandy demonstrated a preference, selecting one type of task for 70% of the sessions, the levels of preference between the two task formats were not as discrepant as Mica's. The performances between these two task formats were similar for both students regardless of whether the task was selected by him/herself or assigned by the teacher. Researchers had similar findings when they studied the effects of relative preference values of the choice alternatives (e.g., Bambara, Ager, & Koger, 1994; Killu, Clare, & Im, 1999; Lerman et al., 1997; Smith, Iwata, & Shore, 1995). For example, Bambara and colleagues showed that when choice options contained tasks from both high- and low-preference categories (i.e., difference of levels of preference exceeded 50%), students had higher task engagement regardless of whether the task was assigned by the teacher or chosen by themselves. When a choice option contained tasks from low- and moderate-preference categories (i.e., difference of levels of preference below 50%), participants demonstrated minimal difference of on-task behavior between the choice and teacher-assigned conditions. Therefore, providing opportunities to choose may not be an effective strategy to improve task performance if students are indifferent to the choice alternatives that teachers provide.

The results of the study must be interpreted within the context of its limitation. First, even though our results regarding the effects of preference discrepancy are similar to those found elsewhere (e.g., Bambara et al., 1994), we are limited in our ability to make direct comparisons with these other works because we did not use a formal preference assessment procedure to empirically identify and include task presentation formats that had both discrepant and less discrepant levels of preference for individual students. The preference for task formats was not evaluated a priori, but rather, was determined as part of the study. Also, the number of teacher selections per task format was not directly yoked to the number of subject selections; as such, the participants had unequal opportunities to respond to the specific task format during the teacher assigned and student choice conditions. For example, Mica chose to complete paper slips once but this task format was assigned to him nine times. Unequal representation of the data points in teacher assigned and student choice conditions may have affected the outcome of the study.

Second, the modest effects of choice making on academic productivity demonstrated in this study may also be a result of the lack of sensitivity of the procedures used. Digits correct per minute on the math tasks used in the current study is equivalent to the absolute response rate in a single-operant arrangement. That is, students selected one of the two alternatives and worked on the selected alternative throughout the entire session. However, other researchers have suggested that the relative rates of responding in a concurrent-operant arrangement condition is more sensitive to the effects of choice conditions (Fisher, Thompson, Piazza, Crosland, & Gotjen, 1997). One example of a concurrent operant choice condition is to make choices of different task formats constantly available to participants throughout a session so that participants can switch between choice options at any time (e.g., Lannie & Martens, 2004). Researchers can examine the effects of choice making by recording student's response allocation between the choice alternative and it is a more sensitive to the effects of choice making. Perhaps future researchers can compare the effects of experimental methodologies on task performance (e.g., single versus concurrent operant). In addition, only three students participated in the study. Students with learning disabilities have large discrepancies of needs and preferences. Therefore, further research is warranted to determine if the finding of the study applies to other students with learning disabilities.

5. Conclusion

As a means used to express preferences, choice making increases the probability of correctly identifying and providing the most preferred tasks and reinforcers for students. Providing choices among multiple tasks and reinforcers is a simple, quick, and inexpensive means of further increasing the effectiveness of reinforcers (Tiger, Hanley, & Hernandez, 2006). However, effective academic interventions have limited value if educators are not able to implement the procedure (Wallace et al., 2003). Researchers have suggested that the feasibility of choice interventions may be limited by the type of choice options teachers can offer in a typical classroom setting. In addition, interventions that result in significant curricular changes may limit a child's opportunity to eventually be fully included (Kern, Mantegna, Vorndran, Bailin, & Hilt, 2001; Kern & State, 2009). In the current study, we extended the application of choice interventions by providing students with a choice of identical academic tasks presented on the worksheets and paper slips without compromising the academic integrity of assignments. The results of the study suggest that modification of task presentation format may influence student preference. Therefore, task presentation format may be a promising choice alternative teachers can give to students in the typical classroom setting. In addition, we strengthened the external validity of the choice procedure by the naturalistic features of the current context. First, the procedure was conducted in the students' classroom under the supervision of the classroom teacher, and all of the assignments were entirely consistent with the ongoing classroom curricula. Second, the intervention did not compromise the academic integrity or require extensive training. Also, the teacher reported the intervention was easy to implement and did not require additional resources. All these characteristics of the intervention indicate that this procedure is likely to be acceptable to teachers (Witt, Elliott, & Martens, 1984).

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